

What is claimed is:

1. A paper post-processing apparatus for folding a paper ejected from an image forming apparatus at a paper folding process section, the paper folding process section comprising:

a pair of folding rollers contacting each other with a prescribed pressure, and each of the pair of folding rollers is rotatably supported by a shaft;

a pair of fold/transporting rollers each of which contacts with each of the pair of folding rollers with a prescribed pressure, and is rotatable;

a driving unit for driving the pair of folding rollers;

a folding roller moving unit for moving the pair of folding rollers to a pressure contact position and to a releasing position; and

a drive switching unit for switching a rotation direction of the pair of folding rollers,

wherein when transporting a paper without folding the paper at the paper folding process section, the holding roller moving unit moves the pair of folding rollers to a releasing position, and the drive switching unit switches the rotation direction of the pair of folding rollers to the same direction with each other; and when folding the paper at the

paper folding process section, the holding roller moving unit moves the pair of folding rollers to the pressure contact position, and the drive switching unit switches the rotation direction of the pair of folding rollers to the reverse direction with each other.

2. The paper post-processing apparatus of claim 1, the paper folding process section further comprising:

a pair of gears, each of which is fixed to each shaft of the pair of folding rollers at the end part outside a paper feeding area, engaging with each other when the pair of folding rollers are in the pressure contact position; and

an idler gear engaging selectively to the pair of gears, the idler gear moving to a release position when the pair of folding rollers are in the pressure contact position, and the idler gear moving to an engaging position in-between the pair of gears to transfer a driving force when the pair of folding rollers are in the releasing position,

wherein the drive switching unit switches the rotation direction of the pair of folding rollers by making the idler gear move to the engaging position and to the release position.

3. The paper post-processing apparatus of claim 2, wherein the drive switching unit comprises a cam and a follower roller following the cam.

4. The paper post-processing apparatus of claim 1, the paper folding process section further comprising:

an opening/closing cam provided on a supporting shaft of one of the pair of folding rollers;

a pressure contact member provided on a supporting shaft of the other one of the pair of folding rollers, and follows the opening/closing cam with pressure;

an assist member that is arranged at the position symmetrical with the position of the pressure contact member about the supporting shaft of the one of the pair of folding rollers,

wherein the folding roller moving unit moves the pair of folding rollers to a pressure contact position and to a releasing position by driving the opening/closing cam.

5. The paper post-processing apparatus of claim 4, the drive switching unit comprising a drive switching cam for switching the rotation direction of the pair of folding rollers by cooperating with the opening/closing cam.

6. The paper post-processing apparatus of claim 4, wherein, the opening/closing cam is in a disc shape and is formed to be linearly symmetrical about a line crossing a center of the supporting shaft.

7. The paper post-processing apparatus of claim 4, wherein, the opening/closing cam is rotatable about the supporting shaft.

8. The paper post-processing apparatus of claim 4, wherein, each of the pressure contact member and the assist member is a follower roller in a disc shape and is rotatable about the respective supporting shaft.

9. The paper post-processing apparatus of claim 4, wherein, drive transmission among the opening/closing cam, the pressure contact member and the assist member is conducted through frictional contact.

10. The paper post-processing apparatus of claim 1, further comprising:

a sensor provided at an upstream side of a nipping position of the pair of folding rollers in the direction of paper transportation; and

a control unit; wherein after the sensor detects the passage of a leading edge of the paper, the control unit counts prescribed pulses, then, stops driving rotation of the pair of folding rollers and rotation of the pair of fold/transporting rollers to stop the paper at the prescribed position.

11. An image recording apparatus comprising:

an image recording section for recording an image on a paper; and

a paper post-processing section for folding the paper; the paper post processing section comprises a first folding process section, a second folding process section and a third folding process section, all the three folding process sections being provided in a paper transportation path and selectively conduct a paper folding process; the paper transportation path comprising a first transportation path, a second transportation path, a third transportation path, and a transportation bypath; wherein,

a paper folded at the first folding process section is led to the second folding process section or to the third folding process section through the first transport path,

a paper folded at the second folding process section is led to the third folding process section through the second transport path,

a paper to be transported without folded at neither of the first, the second or the third folding process section is transported to an exit through the transportation bypath,

wherein a paper folding direction at the first and the second folding process sections is reverse to a folding direction at the third folding process section.

12. The image recording apparatus of claim 11, each of the first, the second and the third folding process sections comprising:

a pair of folding rollers contacting each other with a prescribed pressure, and each of the pair of folding rollers is rotatably supported by a shaft;

a pair of fold/transporting rollers each of which contacts with each of the pair of folding rollers with a prescribed pressure, and is rotatable;

a driving unit for driving the pair of folding rollers;

a folding roller moving unit for moving the pair of folding rollers to a pressure contact position and to a releasing position; and

a drive switching unit for switching a rotation direction of the pair of folding rollers,

wherein when transporting a paper without folding the paper at the paper folding process section, the holding roller moving unit moves the pair of folding rollers to a releasing position, and the drive switching unit switches the rotation direction of the pair of folding rollers to the same direction with each other; and when folding the paper at the paper folding process section, the holding roller moving unit moves the pair of folding rollers to the pressure contact position, and the drive switching unit switch the rotation direction of the pair of folding rollers to the reverse direction with each other.

13. The image recording apparatus of claim 12, each of the first, the second and the third folding process sections further comprising a guide member for guiding a paper; the guide member is movable to a guide position for guiding a paper edge portion toward a nip position of each of the pair

of folding rollers, and to a retreat position retreated from the guide position;

wherein, in the first folding process section the guide member is rotatable about an axis of upstream roller of the pair of fold/transporting rollers,

in the second folding process section, the guide member is rotatable about an axis of downstream roller of the pair of fold/transporting rollers, and

in the third folding process section, the guide member is movable back and forth in the vicinity of the nip position of the pair of folding rollers in the direction perpendicular to the transport direction for papers.

14. The image recording apparatus of claim 12, wherein both the first and the third folding process sections conduct fold processing to perform Z fold for an incoming paper whose image surface is facing to the pair of folding rollers of the first folding process section.

15. The image recording apparatus of claim 14, wherein a trailing edge of an image having been formed on a leading edge side of the incoming paper...



16. The image recording apparatus of claim 12, wherein both the first and the second folding process sections conduct fold processing to perform outside three fold, inside three fold and double parallel fold processing for an incoming paper whose image surface is facing to the pair of folding rollers of the first folding process section.

17. The image recording apparatus of claim 12, wherein all the first, the second and the third folding process sections conduct fold processing to perform inside four fold for an incoming paper whose image surface is facing to the pair of folding rollers of the first folding process section.

18. The image recording apparatus of claim 12, wherein the first folding process section conducts fold processing to perform outside center fold for an incoming paper whose image surface is facing to the pair of folding rollers of the first folding process section.

19. The image recording apparatus of claim 12, wherein the third folding process section conducts fold processing to perform inside center fold for an incoming paper whose image

surface is facing to the pair of folding rollers of the first folding process section.

20. A paper post-processing apparatus for punching a paper to make a hole for filing, comprising:

- a punching unit;

- a transporting roller for nipping and transporting the paper, comprising a driving roller and a driven roller arranged at the downstream side of the punching unit in a paper transport direction,

- an urging member for urging the driven roller to come into pressure contact with the driving roller,

- an actuator for releasing the driven roller from the pressure contact with the driving roller against urging force of the urging member, when the actuator being energized,

- an aligning unit for aligning the paper laterally in the direction of a paper width perpendicular to the paper transport direction, and

- a stopper member arranged at the upstream side of the punching unit in the paper transport direction, and the stopper member can be inserted into or retreated from a paper transporting path, wherein,

(i) the transporting roller nips and transports the paper under the condition that the stopper member is retreated from the paper transporting path, then,

(ii) the actuator is energized to release nipping of the paper by the transporting roller after at least the leading edge portion of the paper has passed through the punching unit,

(iii) the aligning unit aligns the paper laterally,

(iv) energizing of the actuator is stopped so that the transporting roller nips the paper again, and

(v) the punching unit punch the paper, after the stopper member inserted into the paper transporting path hits a trailing edge of the paper.

21. The paper post-processing apparatus of claim 20, wherein after the energizing of the actuator is stopped, the transporting roller nips the paper and rotates reversely to transport the paper in the reverse direction, so that the trailing edge of the paper hits the stopper member.

22. The paper post-processing apparatus of claim 20, further comprising an inlet roller for introducing the paper,

which is placed at the upstream side of the punching unit in the paper transporting direction, to the punching unit.

23. The paper post-processing apparatus of claim 20, wherein the actuator is a solenoid actuator.

24. The paper post-processing apparatus of claim 20, wherein there are provided two sets of the transporting roller and the actuator.

25. An image forming system comprising:

- an image forming section for recording an image on a paper;

- a paper transporting section for transporting the paper;

- a paper post-processing section for punching the paper;

and ,

- a controller for controlling the image forming system;

wherein, the paper post-processing section comprising:

- a punching unit;

- a transporting roller for nipping and transporting the paper, comprising a driving roller and

a driven roller arranged at the downstream side of the punching unit in a paper transport direction,

an urging member for urging the driven roller to come into pressure contact with the driving roller,

an actuator for releasing the driven roller from the pressure contact with the driving roller against urging force of the urging member, when the actuator being energized,

an aligning unit for aligning the paper laterally in the direction of a paper width perpendicular to the paper transport direction, and

a stopper member arranged at the upstream side of the punching unit in the paper transport direction, and the stopper member can be inserted into or retreated from a paper transporting path, wherein,

(i) the transporting roller nips and transports the paper under the condition that the stopper member is retreated from the paper transporting path, then,

(ii) the actuator is energized to release nipping of the paper by the transporting roller after at least the leading edge portion of the paper has passed

(iii) the aligning unit aligns the paper laterally,

(iv) energizing of the actuator is stopped so that the transporting roller nips the paper again, and

(v) the punching unit punch the paper, after the stopper member inserted into the paper transporting path hits a trailing edge of the paper.

26. A paper punching method to punch a paper to make a hole for filing at a prescribed position on the paper transported, by using a punch unit, comprising:

nipping and transporting the paper with a transporting roller arranged at the downstream side of the punching unit in a paper transport direction to make at least a leading edge of the paper pass through the punching unit;

releasing nipping of the paper with the transporting roller by energizing an actuator;

aligning the paper laterally by an aligning unit in the paper width direction perpendicular to the paper transport direction;

nipping the paper again with the transporting roller, by stopping the energizing of the actuator;

inserting a stopper member arranged at the upstream side of the punching unit in the paper transport direction in the paper transport path;

making a trailing edge of the paper hit the stopper member; and

punching the paper by the punching unit.

27. The paper punching method of claim 26, wherein after the step of nipping the paper again with the transporting roller, by stopping the energizing of the actuator, the transporting roller nips the paper and rotates reversely to transport the paper in the reverse direction, so that the trailing edge of the paper hits the stopper member.

28. The paper punching method of claim 26, wherein the stopper member is retreated from the paper transport path during the step of nipping and transporting the paper with a transporting roller to make at least a leading edge of the paper pass through the punching unit.

29. The paper punching method of claim 26, wherein wherein the actuator is a solenoid actuator.